

THE POST OAK SAVANNA ECOREGION: A FLORISTIC ASSESSMENT OF ITS UNIQUENESS

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ABSTRACT

Quantitative methods were used to compare the flora of the Post Oak Savanna and Oak-Pine-Hickory ecoregions of the West Gulf Coastal Plain. The analyses show that the two areas are nearly identical floristically.

KEY WORDS: Post Oak Savanna ecoregion, Oak-Pine-Hickory ecoregion, biogeography, West Gulf Coastal Plain

RESUMEN

Se usaron métodos cuantitativos para comparar la flora de las ecoregiones Post Oak Savanna y Oak-Pine-Hickory de la llanura costera del West Gulf. Los análisis muestran que las dos áreas son casi idénticas florísticamente.

INTRODUCTION

A half century ago, Webb (1950) examined the methodology of biogeographers who worked in Oklahoma and Texas and found that not only they did not agree among themselves on the location and description of biogeographic regions, but that regional delineation was subjective. He suggested a remedy: "Quantitative methods must be developed before general agreement on the extent of the major [ecoregions] can be reached. As long as personal opinion and individual judgment are the only bases for judging the extent of the [ecoregions], fundamental and insoluble differences of opinion will continue" (Webb 1950:246). This situation remains essentially unchanged today (MacRoberts & MacRoberts 2003a). The purpose of this paper is to describe the botanical similarities and differences between the Post Oak Savanna (POS) region or ecoregion and the adjacent Oak-Pine-Hickory (OPH) region or ecoregion (herein region, ecoregion, and vegetation area are used interchangeably).

STUDY AREAS

The Post Oak Savanna region (POS) of Texas has been considered a distinct veg-

etation area (ecoregion) since Harshberger (1911) mapped it, but it was Shantz and Zon (1924) and later Gould (1962) who gave it its modern shape (MacRoberts & MacRoberts 2003a) (Fig. 1).

The POS region has been described repeatedly. It is a gently rolling or hilly region comprising 30,000 to 40,000 sq. km with elevations from 90 to 250 m above sea level. Annual rainfall is 75 to 115 cm with highest rainfall in May and June. The Carrizo Sands extend along the length of the region. Soils on the uplands are acid sandy loams or sands. Bottomland soils are generally acid sandy loams and clays. Prairies are scattered throughout, notably in the south. The area contains a diversity of plant communities, from hillside pitcher plant bogs, peat bogs, and upland marshes to open xeric sandylands, oak-hickory forests/woodlands, prairies, and bottomland floodplains. Overstory trees in the uplands are primarily *Quercus stellata* Wang., *Q. margaretta* (Ashe) Ashe ex Small, *Q. marilandica* Muenchh., and *Carya* spp. The virtual absence of pine is emphasized. Understory vegetation includes common grasses *Schizachyrium scoparium* (Michx.) Nash, *Sorghastrum nutans* (L.) Nash, *Panicum virgatum* L., *Tridens flavus* (L.) Hitchc., *Bothriochloa saccharoides* (Sw.) Rydb., *Nassella leucotricha* (Trin. & Rupr.) Pohl, *Chasmanthium sessilifolium* (Poir.) Yates. Further description of the POS region can be found in many sources (e.g., Correll & Johnston 1970; LBJ School of Public Affairs 1978; Hatch et al. 1990; Telfair 1999).

McBryde (1933) conducted the first major floristic study of the POS region, emphasizing the Carrizo Sands. Recent studies have been on grasslands (Smeins & Diamond 1983), bogs and marshes (MacRoberts & MacRoberts 1998, 2001), creek systems (Telfair 1988), and xeric sandylands (MacRoberts et al. 2002a). What has not been studied is the floristic similarities and differences between the POS region and its adjacent "ecoregions" or "vegetation areas" (MacRoberts & MacRoberts 2003a).

The OPH region, to which we mainly compare the POS region, consists of about 175,000 sq. km in east Texas, west Louisiana, south Arkansas, and southeast Oklahoma. It is characterized by the presence of pine and by the frequent co-dominance of pine, oak, and hickory in the forest or woodland canopy. Precipitation is about 100 cm per year. The terrain varies from nearly level to gently undulating. Upland soils are generally acidic sandy loams and sands over sandy loam and clay. Bottomlands are acidic sands and clays and loams. The dominant vegetation is a mixed pine-hardwood forest on the uplands and a mixed hardwood forest on the bottomlands. *Pinus taeda* L. and *P. echinata* Mill. occur throughout. *Pinus palustris* Mill. is confined to the southern part of the OPH region. Principle hardwoods are those that occur over most of the southeast coastal plain: *Liquidambar styraciflua* L., *Quercus* spp., *Nyssa sylvatica* Marsh., *Magnolia* spp., *Ulmus* spp., *Populus deltoides* Bart. ex Marsh., *Carya* spp., *Acer* spp., *Fagus grandifolia* Ehrh., *Fraxinus* spp., *Taxodium distichum* (L.) L. Rich. Further description of the OPH region can be found in many sources (e.g.,

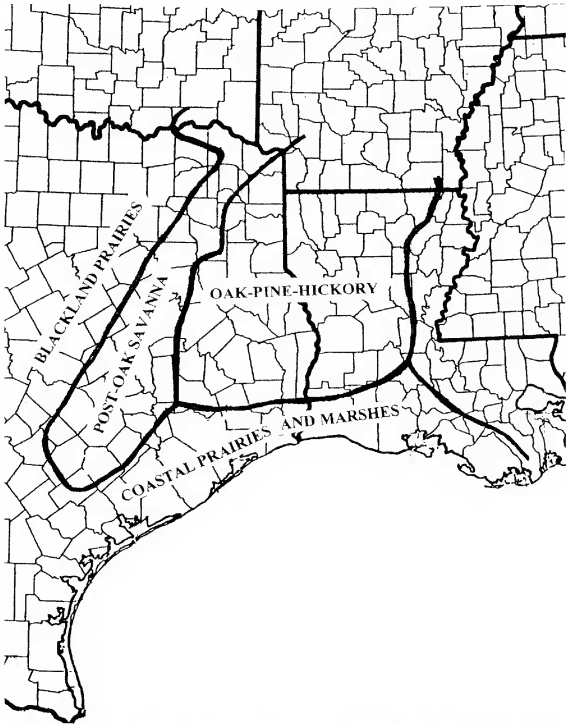


FIG. 1. Traditionally recognized ecoregions of the West Gulf Coastal Plain.

see Correll & Johnston 1970; Hatch et al. 1990; Telfair 1999 and references contained therein). The longleaf pine portion of the OPH region (often considered to be a separate ecoregion itself, is not so considered here) in southeast Texas and south-central Louisiana has been by far the best studied portion of the OPH region (see Harcombe et al. 1993; MacRoberts & MacRoberts 2003a for literature).

METHODS

1. In order to determine the uniqueness of the POS region, we examined the distribution of the taxa on the Singhurst et al. (2003) list of the flora of the 4,466 ha Gus Engeling Wildlife Management Area (GEWMA) in Anderson County, in the middle of the POS region. This sample contains 830 native taxa from a wide variety of communities and habitats including bogs, marshes, xeric sandylands, stream bottoms, and oak-hickory woodlands. Using all available sources (e.g., Hatch et al. 1990; Thomas & Allen 1993-1998; Turner et al. 2003; *Flora of North America*; Evans n.d.), we determined how many of the taxa on the Singhurst et al. (2003) list occur in the OPH region and/or in the coastal region of southeast Texas and Louisiana and how many of them are either confined to the POS region or to that region and areas westward.

2. Since high endemism is often considered a key indicator of ecoregional uniqueness (Tahkhtajan 1986), we studied the distribution of endemic West Gulf Coastal Plain taxa to see how many are unique to the POS region (see MacRoberts et al. 2002b for West Gulf Coastal Plain endemics and their community affiliations).

3. In order to discover the North American affinities of the POS region, using Kartesz and Meacham (1999) we plotted the North American distribution by state or regional area of the 830 native taxa on the Singhurst et al. (2003) GEWMA list. We converted the results into percentage of taxa that occur in each state or regional area (see MacRoberts & MacRoberts 2003b for details of this method).

RESULTS

1. Ninety-eight percent of the native taxa found at GEWMA also occur in the OPH and/or coastal plain regions of Texas and Louisiana. Only two percent are either endemic to the POS region or reach their eastern limit in the POS region.

2. Of the approximately 100 endemic taxa of the West Gulf Coastal Plain, only nine are endemic or near endemic to the POS region. These are *Abronia macrocarpa* L. Galloway, *Brazoria truncata* (Benth.) Engelm. & Gray, *Hymenopappus carrizoanus* B.L. Turner, *Lactuca hirsuta* Muhl. ex Nutt. var. *albiflora* (Torr. & Gray) Shinnars, *Monarda viridissima* Correll, *Paronychia setacea* Torr. & Gray, *Polygonella parksii* Cory, *Rhododon ciliatus* (Benth.) Eping, and *Valerianella florifera* Shinnars. All of these taxa are associated with a single plant community: xeric sandylands (MacRoberts et al. 2002b). This community accounts for fifty percent of the endemics in the West Gulf Coastal Plain and is associated with the Carrizo Sands and other upland sandy areas and terraces that run the length of the POS region and spread out across the OPH region (McBryde 1933; MacRoberts & MacRoberts 1994, 1995, 1996; MacRoberts et al. 2002a). The remaining West Gulf Coastal Plain endemics occur in either both the POS region and the OPH region or in the OPH region alone.

3. The GEWMA flora is overwhelmingly eastern and notably southeastern (Fig. 2). Ninety-five percent of the taxa occurring at GEWMA occur in Louisiana, 92 percent in Arkansas, 89 percent in Oklahoma, 85 percent in Mississippi, 81 percent in the Carolinas, and 53 percent in New York and the New England states, but only 28 percent in New Mexico. This is consistent with our previous finding that eastern flora characterizes east Texas to about 95 degrees W. longitude, at which point east begins to give way to west over the next 300 km (MacRoberts & MacRoberts 2003b). GEWMA is located at about 96 degrees W. longitude on the eastern edge of this broad transition zone, and is thus essentially eastern, as the above figures indicate.

DISCUSSION

Unfortunately, for our floristic analysis there is no operational definition of ecoregion or any of the other "chorionomic" categories (e.g., region, province, district, subdistrict) that biogeographers use (Takhtajan 1986). The best definition we have found for ecoregion is that it is a distinct assemblage of natural communities and species involving a fairly large geographical region (Ricketts & Dinerstein 1999; The Nature Conservancy 2003). Takhtajan (1986) also states that endemism is fairly high, notably at the species and subspecies level. But these statements are of little help since they do not designate whether 25% or 50% difference in species composition constitutes a distinct assemblage or just what percent of the total should be endemic.

Nonetheless, our main finding is that the POS region differs only insignificantly from the OPH region. Far fewer than one percent of its taxa are endemic to it and only about two percent of its taxa do not also occur in the adjacent region to its east.

As part of our floristic study of the POS region, we examined and compared all community classifications for the POS and OPH region to see how many communities described for the POS region were unique to it (Marks & Harcombe 1981; Diamond et al. 1987; Harcombe et al. 1993; Texas Natural Heritage Program 1995; Nesom et al. 1997; Turner et al. 1999; Van Kley 1999a, 1999b; Bezanson 2000; Fleming et al. 2002; Louisiana Natural Heritage 2003; Singhurst et al. 2003). While this was not a quantitative analysis, we found the community structure of the POS region to be virtually identical with the OPH region. No community appeared to be unique to it. Those communities that typify it: upland post oak hickory forest/woodland, xeric sandylands, prairies, glades, baygalls, and so forth also occur in the OPH region (e.g., Marietta & Nixon 1983, 1984; Ward & Nixon 1993; Nesom et al. 1997; MacRoberts et al. 2002a). If there is anything distinctive about the POS region, it is that some of these communities (e.g., xeric sandylands, prairies) are more common in that region than they are farther east. Ironically, while the absence of pine is the feature most often noted for the POS region, pine does occur in the POS region, most dramatically

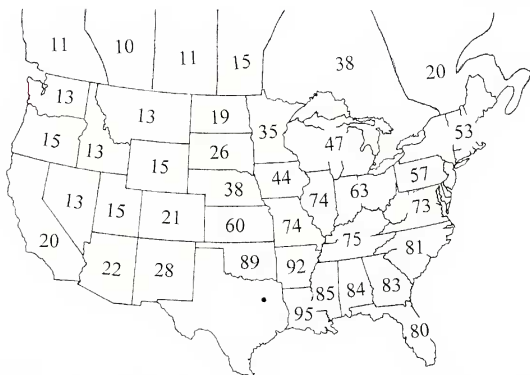


FIG. 2. Association of Post Oak Savanna flora expressed as percentages of flora at Gus Engeling Wildlife Management Area occurring in each state, province, or region. Dot in Texas is the location of Gus Engeling Wildlife Management Area (see text for further explanation).

at its western edge in Bastrop County, where *Pinustaeda* is often a dominant or co-dominant canopy species (Wilson 1990).

Neither a botanist nor a plant ecologist familiar with the southeastern flora would find much new in the POS. The main difference would be the absence of pines in some areas and the different frequency of communities and thus taxa in others. Even the few endemics to the region are tied to one community type—xeric sandylands—which occurs as far east as southwest Arkansas, central Louisiana, and southeast Texas (MacRoberts & MacRoberts 1994, 1995, 1996; MacRoberts et al. 2002a). The difference between the POS and the OPH regions is one of degree, not of kind. This finding agrees with a number of previous workers who have indicated the lack of a sharp boundary between the OPH and POS and who have questioned the floral uniqueness of the POS altogether (e.g., Tharp 1926; McCarley 1959; Diggs et al. 1999; MacRoberts & MacRoberts 2003a). Basically, the POS region is part of the 300 km ecotone between east and west, just as is the north central Texas prairie and cross timbers region (Diggs et al. 1999; MacRoberts & MacRoberts 2003b).

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